

# **Trex Enterprises Corporation**

## **Aerospace Capability Brief**

Presented to:

Hawaii State Legislature  
Hawaii Aerospace Industry

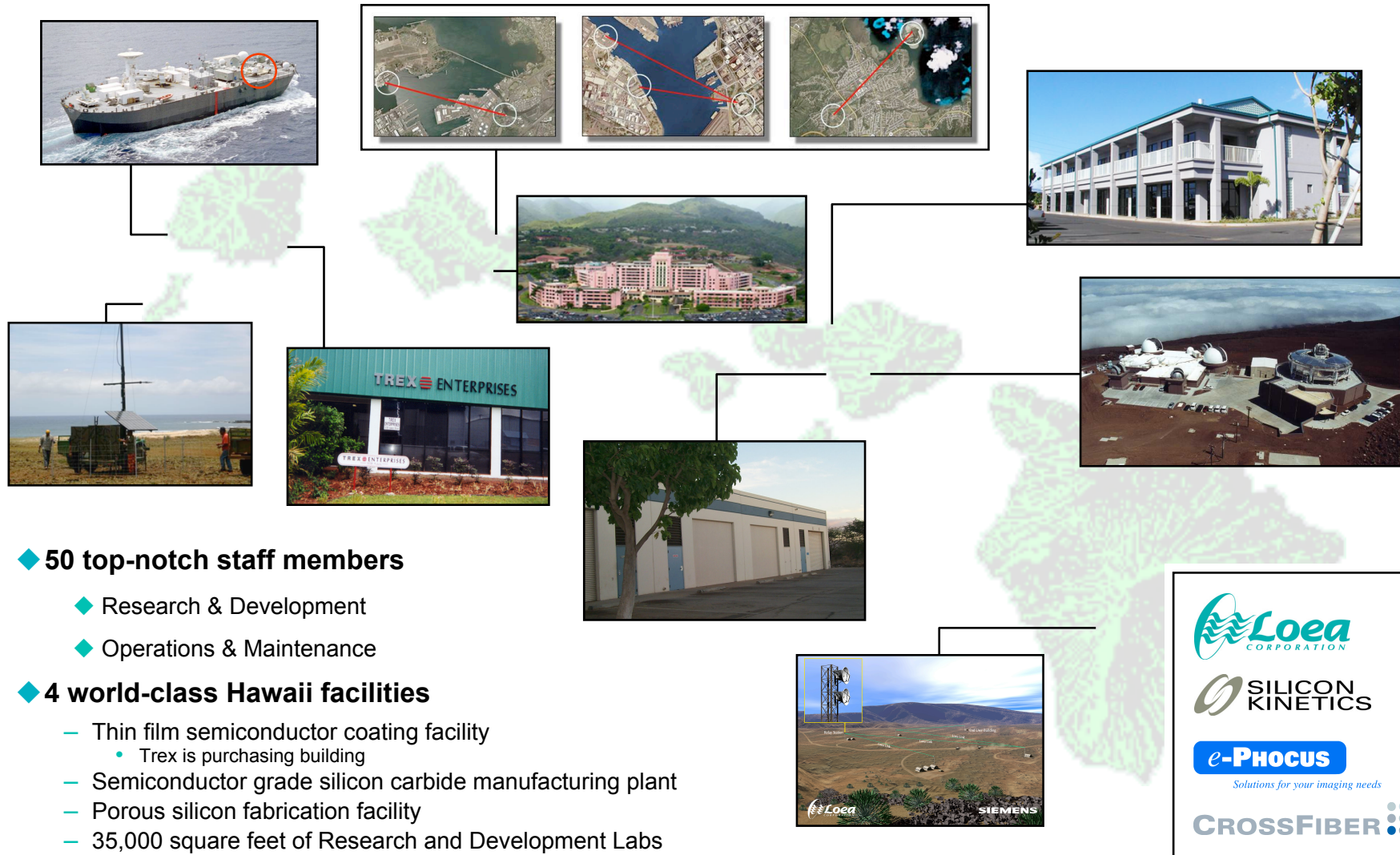
**Daron Nishimoto**  
*R&D Program Manager*  
*Hawaii Business Development Mgr*

21 August 2008

# Trex's Core Competencies Focus on Dual-Use Aerospace Technologies

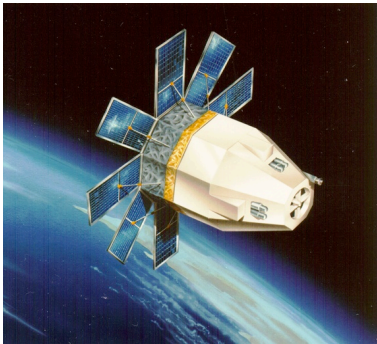
- ◆ **Trex Enterprises Corporation introduction**
- ◆ **Space Superiority challenges and needs**
- ◆ **Trex's aerospace technology portfolio**
  - ◆ Ground-based technologies
  - ◆ Space-based technologies
  - ◆ Ship-based technologies
  - ◆ Aerospace partnerships for technology insertion
- ◆ **Innovative dual-use Hawaii-based subsidiaries**
  - ◆ e-Phocus (CMOS development)
  - ◆ CrossFiber (Fiber optic switches)
  - ◆ Loea Communications (MMW/RF Hi-bandwidth comm)
  - ◆ Silicon Kinetics (Medical bio-sensors)

# Trex Operations in the Hawaiian Islands





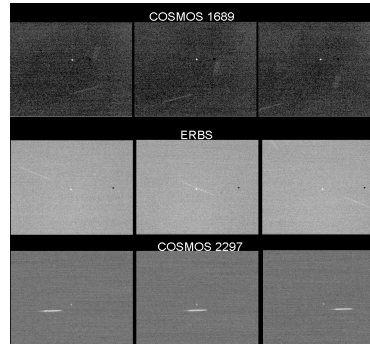
# Trex has Developed Technologies for SSA



Trex developed Rapid Optical Beam Steering with laser radar for SDIO midcourse discrimination



Large aperture mobile imaging systems



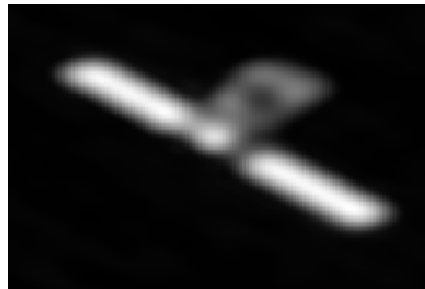
Satellite streaks while observing stars in daylight



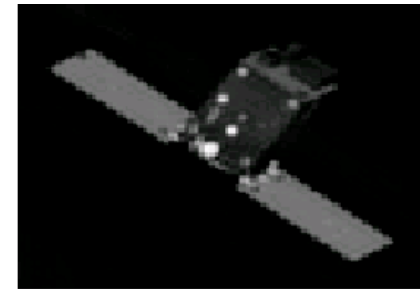
Large lightweight SiC mirrors in less than 6 months



Ship-based Optical Platforms  
Potential GPS Back-up



Simulated passive image  
from 3.67 m telescope



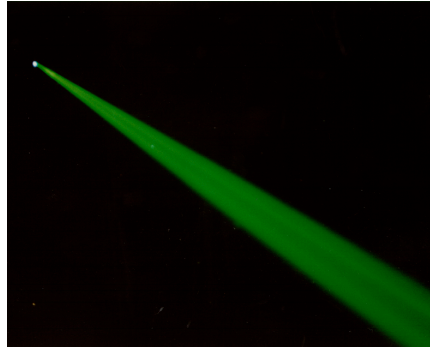
Simulated active image using FT  
➤ 4 x resolution, 24/7 OPS



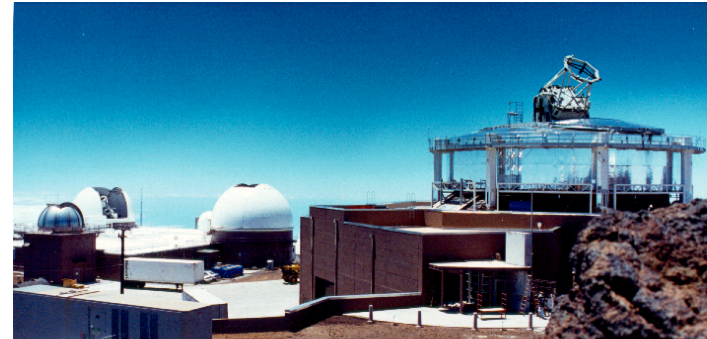
# Trex has Long Term Participation in SSA Programs



HEL Ground-based  
Laser - 1988



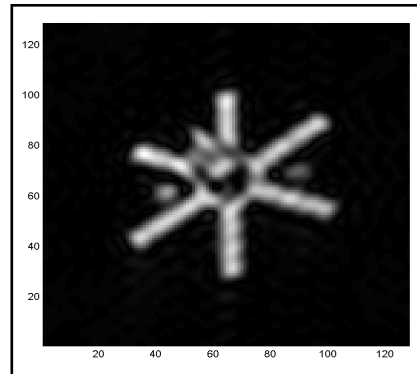
Compensated illumination of  
LEO Sat 1991



Trex has operated and maintained the MSSS  
visible adaptive optics system since 1990



AIT Transmitter Dome  
at SOR



Achieved better than 100 nrad  
resolution with SAINT (3mm  
object at 1.5 km through ground  
turbulence)



Transportable systems



# Ground-based Transportable Optical Imaging Systems

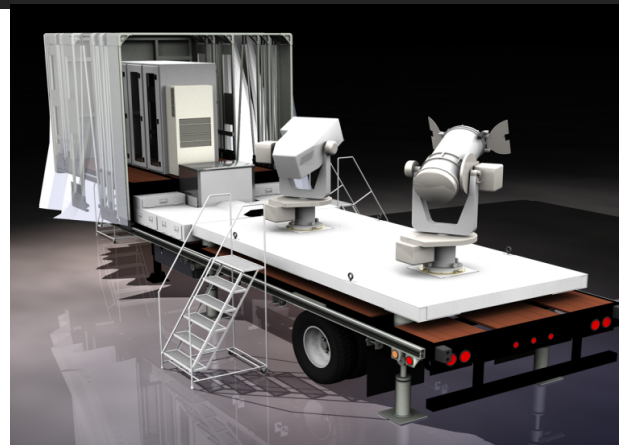
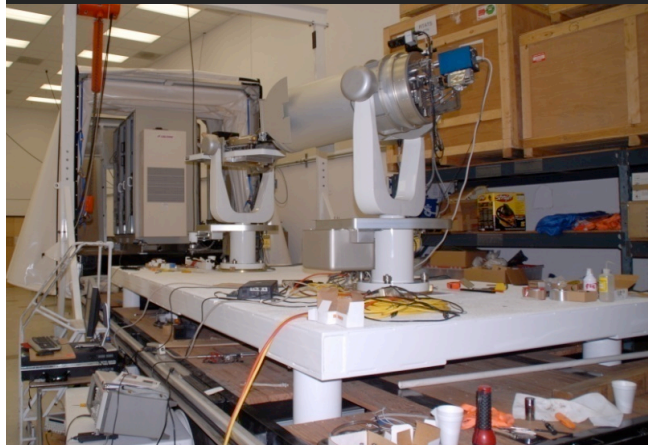
**MDOS**



**SRVS**



**MOTS**



# Ship-based Aegis BMD Space Imaging Platform

## *Motivation for a GPS Back-up*



**The DST performs several critical tasks for Aegis BMD:**

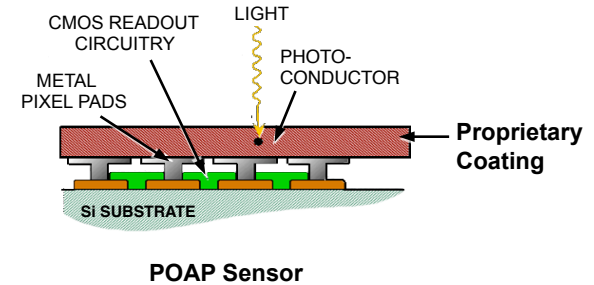
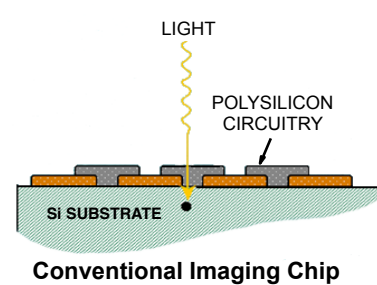
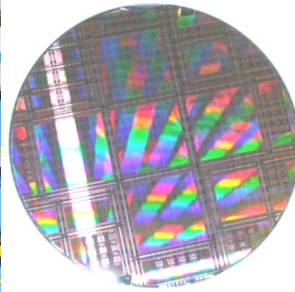
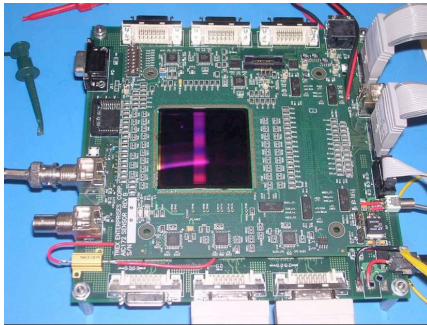
- Provides precision attitude reference for ship INU at-sea calibration not available from GPS
- Provides accurate platform navigation without need for GPS
- Also provides satellite and UAV tracking for Situational Awareness

***Precision, Latitude  
Independent INS  
Attitude Reference***



# Large Format Imaging Sensors for Space-based/UAV Insertion

36 MPixel Video Sensor



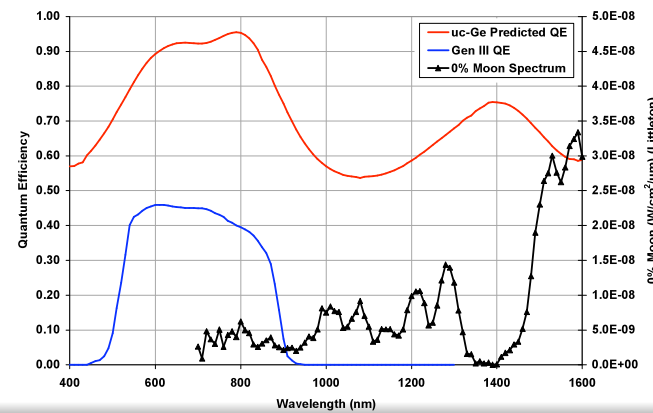
## POAP Technology

### ◆ Large format sensor chips with photodiode coating

- Use entire surface of chip for imaging
- Wavelength sensitivity decoupled from CMOS substrate

## Cameras for Various Applications

- ◆ DoD
- ◆ DHS
- ◆ Commercial



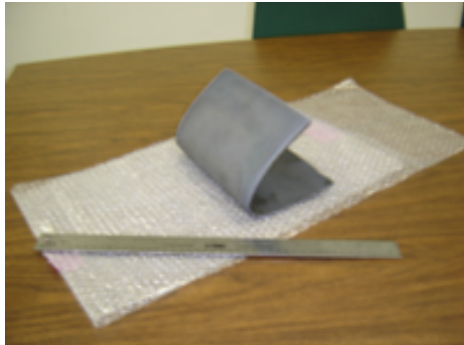
Visible through  
SWIR Sensing

# Advanced Materials for Aerospace Applications

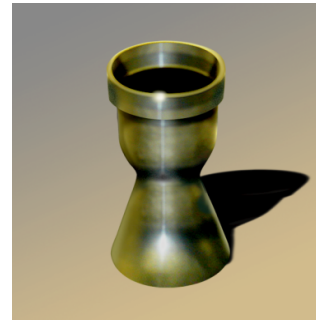
**1.5m SiC mirror  
fabrication  
capability**



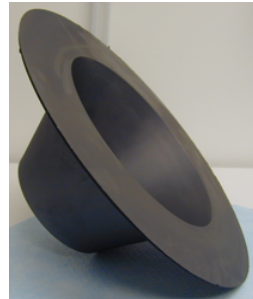
**Leading edge  
fabrication**



**Lightweight mirrors for  
HEL and space  
applications**



**Diverter attitude  
control systems**



## TECHNOLOGY

### ◆ Chemical Vapor Composites (CVC) Silicon Carbide

- Reduced intrinsic stress
- Accelerated growth process compared with CVD

### ◆ CVC Technology Applied to Ultra High Temp Materials Development

- Zirconium and hafnium carbides and diborides

## PRODUCTS

### ◆ Silicon Carbide Mirrors and Optics

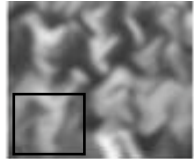
- USAF, NASA, MDA, SMDC, DoD Prime Contractors
- Commercial customers

### ◆ High temperature products

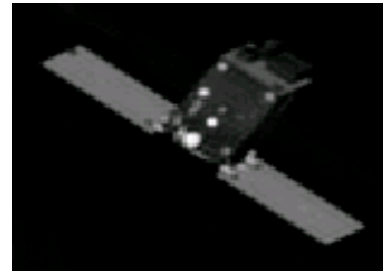
- DOE, MDA, NASA, USAF, Prime Contractors



# Innovative Imaging Algorithm Development



Active Imaging, 12 m baseline  
Simulated 4m object at 1000 km



## TECHNOLOGY

- ◆ Adaptive optics
- ◆ Atmospheric physics
- ◆ Image construction and processing algorithms



## Super Resolution Vision System

- ◆ Facial recognition at 1 km through horizontal ground turbulence
- ◆ For 6 cm lens provides 2 mm resolution of moving faces



MWIR Adaptive Optics

## PRODUCTS

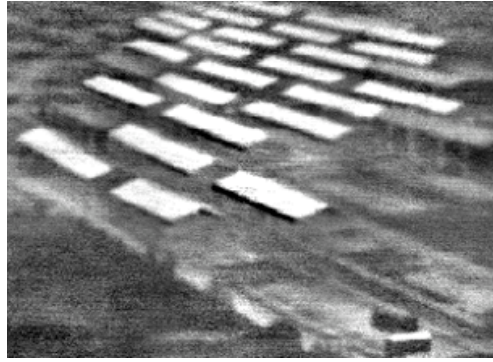
- ◆ Super Resolution Vision System
  - SOCOM / DARPA / Raytheon
- ◆ Precision Celestial Navigation
  - Aegis / SPAWAR / LMCO
- ◆ Satellite Imaging Systems
  - AFRL / MSSS
- ◆ Missile Intercept Test Data
  - MDA, Navy T&E



Daylight Stellar Imaging

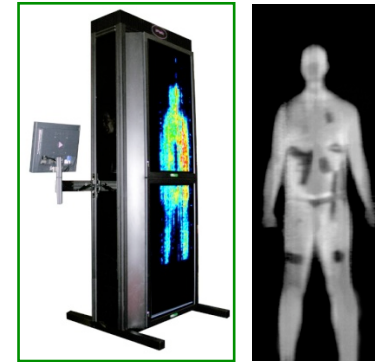


# Maui RF Programs



## Passive Imaging

- ◆ Security Screening
- ◆ Navigation / Surveillance

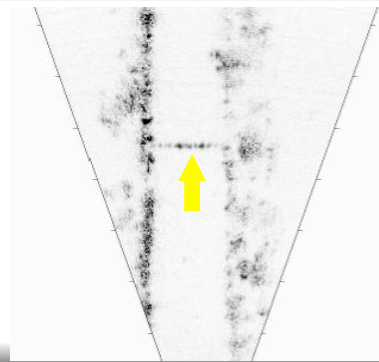


## Wireless Communications

- ◆ Pioneering E-Band Technology
- ◆ Gigabit Ethernet (1.25 Gbps), SONET OC-48 (2.488 Gbps)
- ◆ High-Dev Television SMPTE-292M (1.485 Gbps)
- ◆ Telco Backhaul Open Base Station OBSAI RP3 (3.072 Gbps)

## Active Imaging Radar

- ◆ Obstacle Avoidance
- ◆ Robotic Vision
- ◆ Foreign Object Detection on Runway Surfaces

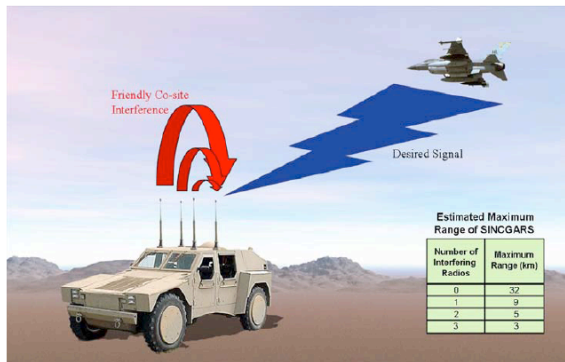


# Maui RF Programs Expanding in Scope



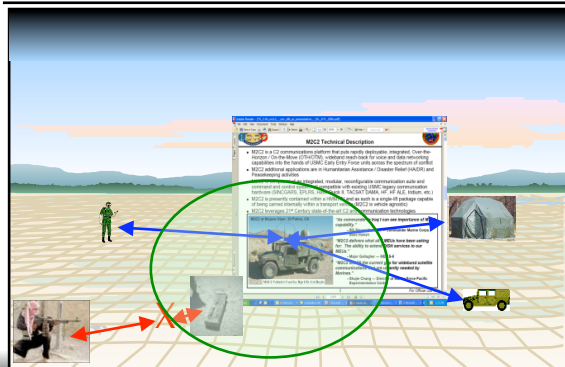
## CLUTTER GENERATOR AND HIGH POWER AMPLIFIER

- ◆ Develops second generation equipment for deployment to Ni'ihau at PMRF – 12 first gen. systems delivered
- ◆ Generate simulated target and Doppler returns
- ◆ High power amplifier for radar under development



## M2C2 - CO-SITE INTERFERENCE MITIGATION

- ◆ 2<sup>nd</sup> generation RF system circuit is employed to allow operation of multiple radios on a common platform with reduced co-site interference
- ◆ Multiple radios use a common antenna
- ◆ Antenna impedance must be matched precisely by circuit



## HALO – SIMULTANEOUS RF JAM AND COMM

- ◆ Provides an RF jamming 'Halo' around a vehicle while allowing simultaneous RF communications
- ◆ Works with any jammer or communications waveform and does not require time or frequency coordination between comm and jam



# Trex Technology Spin Out Ventures



## Ophthonix (Minority Partnership)

- Complete vision optimization solution
- Z-View™ Aberrometer for higher accuracy of vision assessment
- i-Zon™ customized eyeglasses
- Revenue from products



## e-Phocus (Joint Venture)

- Innovative CMOS imaging sensors
- JV for chips for consumer applications launched in Taiwan



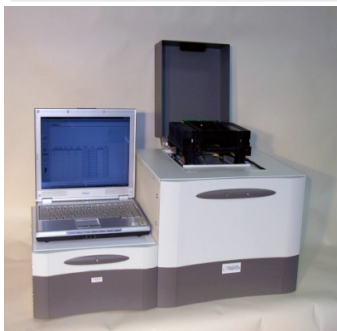
## Sago Systems

- Security applications
- Unprecedented imaging performance in checkpoint and stand-off application
- No x-ray and no gender ID



## Loea Corporation

- Ultra high bandwidth point-to-point wireless communication
- FCC approved MMW radios
- Revenue from products



## Silicon Kinetics

- Proprietary instrumentation
- Improved sensitivity/cost in Protein Interaction Analysis for Biotech Industry



## CrossFiber

- Photonic cross connect and optical add-drop
- Break through performance with break through price



# Take Aways

- ◆ **Trex Hawaii, LLC has experienced continued growth in Aerospace research and development programs in Hawaii since 1990s**
- ◆ **Aerospace programs include**
  - Ground-based systems (Army, Air Force, MDA)
  - Sea-based systems (Navy, MDA)
  - Space-based systems (DARPA, Air Force)
- ◆ **Successfully leveraged dual-use technologies into Hawaii-based Trex subsidiaries**
  - e-Phocus
  - Silicon Kinetics
  - CrossFiber
  - Loea Communications



# Questions?

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